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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of **Roelefs**
Serial No.: **09/960,064**
Filed: **9/21/2001**
Title: **FORCE-MEDIATED RASTERIZATION**

Atty. Docket No.: **US 018156**
Group Art Unit: **2672**
Examiner: **Brier, Jeffery A.**

APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

This is an appeal from the decision of the Examiner dated 16 January 2004, finally rejecting claims 1-18 of the subject application.

I. REAL PARTY IN INTEREST

The above-identified application is assigned, in its entirety, to Koninklijke Philips Electronics, N.V., The Netherlands.

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-18 are pending in the application. Claims 1-18 stand rejected by the Examiner under 35 U.S.C. 102(b).

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection in the Office Action dated 16 January 2004.

V. SUMMARY OF THE INVENTION

The invention comprises a system and method for rendering "glyphs", which are graphic representations of elements, such as letters, numbers, and other symbols, on a display having discrete picture elements (pixels). Typically, the picture elements are rectilinear elements arranged in a two-dimensional array, whereas the glyphs are continuously formed shapes with relatively smooth curves.

Applicant's FIGs. 1A and 1C illustrate a glyph 101, 101' for the character "a", and FIGs. 1B and 1D illustrate the rendering of this glyph on a display comprising square pixels. In like manner, Applicant's FIG. 2A illustrates a sequence of glyphs forming a word, and FIGs. 2B and 2C illustrate the rendering of this word on a display comprising square pixels. When a pixel is entirely covered by the glyph, the pixel appears black; when a pixel is entirely clear of the glyph, the pixel appears white. When the pixel is partially covered, it is either black or white, depending upon the decision-rules used. In either event, whether the partially covered pixel is chosen to be rendered as black or white, a distortion is introduced. That is, whenever a glyph contains a curve or other feature does not correspond to the rectilinear boundaries of the picture elements of a display, distortions will occur. In like manner, when the spacing between glyphs does not correspond to the rectilinear boundaries of the picture elements, visual anomalies are likely, such as the apparent "space" between "id" and "eal" in the word "ideal" in FIG. 2B.

As illustrated in FIGs. 1B, 1D, and FIGs. 2B, 2C, the appearance of a rendered glyph, or sequence of glyphs, depends upon the placement of the glyph relative to the boundaries of the pixels, because different pixels become covered by the glyph to different extents. As illustrated in FIG. 1D, for example, a slight displacement of the glyph 101', compared to glyph 101, results in what appears to be a "more rounded" rendering of the glyph 101/101'. Similarly, a displacement of the letter "e" in the word "ideal" in FIG. 2C, compared to the word "ideal" in FIG. 2B, eliminates the apparent space between "id" and "eal" in the word "ideal".

This invention addresses the determination of the placement of a glyph on a display to potentially minimize distortions and visual anomalies. In conventional systems, the rendering/adjustment of glyphs to avoid distortion and anomalies is generally

performed based on rules developed to avoid particular phenomena, such as gaps in continuous segments of the glyphs, commonly termed "dropouts". Typically, the designer of a glyph provides "hints" (detailed further below) to assure that key-details of a designed symbol are not dropped out, particularly at a reduced scale (Applicant's page 2, lines 18-24). In this invention, the factors that affect the visual appearance of the rendered glyph are modeled as "forces", and the glyph is shifted relative to the boundaries of the pixels based on these forces. By modeling the factors that affect the appearance of the rendered glyph as forces, the adjustment of the position of a glyph can be algorithmically determined to minimize the resultant force on the glyph, thereby potentially minimizing the visual distortions, without requiring the time and resources currently spent on customizing fonts with hints and other heuristic rules (Applicant's page 2, line 24 through page 3, line 21).

As noted above, a factor that affects distortions in the rendering of a glyph is the partial covering of a pixel. A fully-covered or fully-uncovered pixel does not introduce distortions. In the Applicant's example embodiment, each pixel is modeled as an element that can exert a force on the glyph, in an attempt to position the glyph so as to completely cover or completely uncover the pixel. If the forces cause the glyph to move so as to partially uncover previously covered pixels, or partially cover previously uncovered pixels, these new partially-covered pixels will exert an opposing force to maintain their fully-covered or fully-uncovered status. The "stable" position of the glyph is the position at which the forces in each opposing direction are balanced. (Applicant's page 4, lines 10-21.)

Another factor that introduces distortions or visual anomalies is the spacing between characters. In the Applicant's example embodiment, each glyph is modeled as an element that can exert a force upon its adjacent glyphs. The amount of force that is applied is dependent upon the "ideal" spacing between characters, as defined, for example, in printing standards. As the glyph is moved, for example, to minimize pixel-distortions, adjacent glyphs apply forces to counteract a change from the ideal spacing. (Applicant's FIG. 6, and page 9, lines 12-23.)

Preferably, the force models that are used reflect a force that is proportional to the perceived distortions. As illustrated in the Applicant's FIGs. 4, for example, the pixel

forces are modeled as a set of balanced springs, the center point 420 of the springs corresponding to the "center of gravity" of the glyph coverage. If the pixel is fully covered or uncovered, the center point 420 is in the center of the pixel, and the springs are balanced. If the pixel is partially covered, as illustrated in the two-dimensional example of FIG. 5, the center-of-gravity point 520 is offset to the left, and the spring 522 exerts a force to pull the glyph to the right. The arrangement of springs in FIG. 4 will produce linear forces in each of four dimensions. In a typical embodiment, the vertical springs 421, 423 may be eliminated, to prevent a vertical displacement of individual glyphs, or they may be modeled as extremely stiff springs to minimize the displacement (Applicant's page 8, lines 9-12).

Other force models may be used. For example, each pixel may be modeled as a gravity well, to provide a square-law response instead of the linear response provided by spring models (Applicant's page 7, lines 1-5). Non-uniform models may also be used, for example, to model the sensitivity of the eye to different between-character spacings, or to appropriately balance the variety of factors that affect distortions and other anomalies (Applicant's page 9, line 24 through page 10, line 5).

In a preferred embodiment, conventional iterative-search techniques are used to reposition each glyph until a stable position is reached wherein the composite force acting upon the glyph is zero, or at least below a given threshold (Applicant's page 8, lines 21-27). Assuming that the modeled forces correspond to the apparent degree of distortion or visual anomalies, the minimization of the composite force should result in a minimization of the apparent distortions and anomalies (Applicant's page 4, lines 18-21).

VI. ISSUES

Are claims 1-18 patentable under 35 U.S.C. 102(b) over Brassell et al. (USP 5,684,510, hereinafter Brassell)?

VII. GROUPING OF CLAIMS

Claims 1-3 and 10-12 stand or fall together. Claims 4-6, 9, 13-15, and 18 stand or fall together. Claims 7 and 16 stand or fall together. Claims 8 and 17 stand or fall together.

VIII. ARGUMENT

Claims 7 and 16 stand or fall together, and apart from claims 4-6, 9, 13-15, and 18, because claims 7 and 16 specifically recite a rendering system or method that renders a glyph based upon the preferred spacing of the glyph relative to an adjacent glyph, which is patentably distinct from the rendering system of claims 4-6, 9, 13-15, and 18, which recite a rendering system that renders a glyph based upon the amount of coverage of a set of pixels based upon the placement of the glyph.

Claims 8 and 17 stand or fall together, and apart from the other claims, because claims 8 and 17 specifically recite a rendering system or method that uses at least one of a linear, force-density, spring, or gravity well model for determining a preferred placement of a glyph, which is patentably distinct from the other claims.

Claims 1-3 and 10-12 stand or fall together, apart from the other claims, because claims 1-3 and 10-12 recite a rendering system or method that positions a glyph based on a model of forces acting upon the glyph, without the specific limitations in structure or method detailed in claims 4-9 and 13-18.

Are claims 1-18 patentable under 35 U.S.C. 102(b) over Brassell?

Regarding all claims:

Independent claim 1, upon which claims 2-8 depend, specifically recites a rendering system that includes:

a) a force modeler that models forces applied to a glyph dependent upon the placement of the glyph, and

b) a glyph positioner that selects a preferred placement of the glyph based on these forces.

Independent claim 10, upon which claims 11-18 depend, specifically recites:

a) a method of rending a glyph by modeling forces that are applied to the glyph based on the placement of the glyph, and

b) selecting a preferred placement of the glyph, based on these forces.

Brassell is silent with regard to modeling forces applied to a glyph based on its placement, and is silent with regard to placing glyphs based on such forces. Brassell fails to teach either of the above limitations a) or b) of the Applicant's independent claims.

The final Office action notes that "Brassell describes a system that grid fits glyphs onto pixels in accordance with values P, J, and K and pixel coverage values which values force the glyph to one position or another during grid fitting". The Applicant respectfully maintains that this characterization of Brassell does not describe either of the limitations a) or b) of the Applicant's claims.

Brassell's parameters P, J, and K and pixel coverage values are not forces, and their values are not dependent upon the placement of the glyph:

Brassell's parameter P is the height of the glyph (Brassell column 15, lines 40-41); it is not a force, and its value is not dependent upon the placement of the glyph. .

Brassell's parameter J is an integer that "controls whether hinting will be employed when rendering the glyphs" (Brassell column 15, lines 46-47); it is not a force, and its value is not dependent upon the placement of the glyph.

Brassell's parameter K is an integer that "determines whether … the resulting display will be bilevel or grayscale" (Brassell column 15, lines 47-50); it is not a force, and its value is not dependent upon the placement of the glyph.

Brassell's pixel coverage value is used by Brassell "to provide a grayscale value for each physical pixel that is a function of the fraction of the pixel covered by a glyph stroke" (Brassell column 14, lines 42-45); it is not a force, and its value affects the luminance of the pixel, and not the glyph's placement.

The Examiner cites a variety of definitions of "force" to demonstrate that the term "force" can be interpreted broadly. However, the Examiner fails to note where any of these definitions of force apply to Brassell's teachings to demonstrate that Brassell models forces that act on a glyph based on its placement, and to demonstrate that Brassell then uses these modeled forces to select a preferred placement of the glyph.

The Examiner asserts that "since both Brassell and Applicant determine to move a glyph due to pixel coverage then the broadly claimed forces are taught by Brassell" (Examiner's answer, page 2, lines 17-19). The Applicant respectfully notes that the Applicant specifically claims the ***modeling of forces*** applied to a glyph based on the placement of the glyph, whereas, as noted in the Applicant's specification, Brassell uses conventional "hinting" techniques to modify the shape of the glyph (Applicant's page 2, lines 18-24). The Applicant respectfully maintains that conventional hinting techniques do not ***model forces*** that are applied to the glyph, and do not reposition the glyph based on such modeled forces.

As Brassell describes: "It is known in the art that font designers have built into their font specifications, hints that are designed to improve the rendered result at low resolution... These hints are generally slight distortions ...in order to make sure that it will cover certain pixel centers and thus avoid dropout problems... By and large, the hinting rules tend to specify hinting the outer edge of long vertical strokes to a physical pixel boundary and expanding the outside edge of the fist adjacent curvilinear portion to make sure that the center of the next pixel is covered so as not to cause a dropout" (Brassell, column 4, lines 4-20).

Hinting is illustrated in Brassell's FIGs. 2 and 3A, 3B. The dashed line 38 on the glyph strokes in FIG. 2 is the "hint" that the designer of the glyph provides so that the "dropout" of the corner pixel illustrated in FIG. 3A does not occur. Each pixel whose center is covered by the glyph is illuminated, which produces FIG. 3A. Further, the hint 38 indicates that the partially covered pixel at coordinate (1,3) is to be illuminated, which produces the more aesthetically pleasing image 3B. (Brassell, column 10, lines 41-53.) Additionally, FIG. 8 illustrates hinting applied to column 7 of the shape of FIG. 7, wherein the center of each pixel in column 7 is hinted as being covered (Brassell, column

20, lines 24-64). It is significant to note that the glyph is not "repositioned" by hinting, its shape is "distorted" to avoid dropouts.

The Applicant respectfully maintains that Brassell's use of hinting to change the shape of glyphs to avoid dropouts cannot reasonably be said to correspond to a modeling of forces, and cannot reasonably be said to correspond to selecting a preferred placement of the glyph based on such forces.

Regarding claims 4-6, 9, 13-15, and 18:

In claim 4, upon which claims 5-6 depend, and claim 9, the Applicant specifically recites that the force modeler is configured to determine the forces that are applied to the glyph based upon an amount of coverage of a set of pixels.

In claim 13, upon which claims 14-15 depend, and claim 18, the Applicant specifically recites determining the forces that are applied to the glyph based upon an amount of coverage of a set of pixels.

Brassell is silent with regard to determining the forces that are applied to the glyph based on an amount of coverage of a set of pixels. As noted above, the amount of coverage of a pixel in Brassell determines the luminance of the pixel, and does not determine a force that is applied to the glyph. Brassell does not teach this distinguishing element of claims 4-6, 9, 13-15, and 18.

Regarding claims 7 and 16:

In claim 7, the Applicant specifically recites that the force modeler is configured to determine the forces that are applied to the glyph based upon a preferred spacing relative to an adjacent glyph.

In claim 16, the Applicant specifically recites determining the forces that are applied to the glyph based upon a preferred spacing relative to an adjacent glyph.

Brassell is silent with regard to determining the forces that are applied to the glyph based on a preferred spacing relative to an adjacent glyph. Brassell does not teach this distinguishing element of claims 7 and 16.

Regarding claims 8 and 17:

In claim 8, the Applicant specifically recites that the force modeler includes at least one of a linear, force-density, spring, or gravity well model for determining the forces that are applied to the glyph.

In claim 17, the Applicant specifically recites determining the forces that are applied to the glyph based on at least one of a linear, force-density, spring, or gravity well model.

Brassell is silent with regard to modeling forces that are applied to the glyph, and thereby silent with regard to such modeling based on linear, force-density, spring, or gravity well models.

CONCLUSIONS

Because Brassell does not teach the elements of any of the Applicant's claims, the Applicant respectfully requests that the Examiner's rejection of claims 1-18 under 35 U.S.C. 102(b) be reversed by the Board, and the claims be allowed to pass to issue.

Respectfully submitted,

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APPENDIX

CLAIMS ON APPEAL

1. A rendering system comprising:

a force modeler that is configured to model forces that are applied to a glyph in dependence upon a placement of the glyph, and

a glyph positioner, operably coupled to the force modeler, that is configured to select a preferred placement of the glyph, based on the forces that are applied to the glyph at the preferred placement.

2. The rendering system of claim 1, further including

a glyph scaler that is configured to provide the glyph to the glyph positioner, based on a glyph description.

3. The rendering system of claim 1, further including

at least one of a display device and a print device that is configured to render the glyph at the preferred placement.

4. The rendering system of claim 1, wherein

the force modeler is configured to determine the forces that are applied to the glyph based upon an amount of coverage of a set of pixels of an array of pixels.

5. The rendering system of claim 4, wherein

the set of pixels comprises pixels that are partially covered by the glyph.

6. The rendering system of claim 4, wherein

the force modeler is further configured to determine the forces that are applied to the glyph based on a preferred spacing of the glyph relative to an adjacent glyph.

7. The rendering system of claim 1, wherein

the force modeler is configured to determine the forces that are applied to the glyph based on a preferred spacing of the glyph relative to an adjacent glyph.

8. The rendering system of claim 1, wherein

the force modeler is configured to determine the forces that are applied to the glyph based on at least one of:

a linear model,

a force-density model,

a spring model, and

a gravity well model.

9. The rendering system of claim 1, wherein

the force modeler is configured to determine the forces that are applied to the glyph, based on a coverage of one or more pixels by the glyph, so as to effect a change of the coverage of the one or more pixels by the glyph.

10. A method of rendering a glyph to an array of pixels, the method comprising:

modeling forces that are applied to the glyph in dependence upon a placement of the glyph, and

selecting a preferred placement of the glyph, based on the forces that are applied to the glyph at the preferred placement.

11. The method of claim 10, further including

scaling the glyph, based on a description of the glyph.

12. The method of claim 10, further including

rendering the glyph at the preferred placement on at least one of: a display device and a printer device.

13. The method of claim 10, wherein

determining the forces that are applied to the glyph is based upon an amount of coverage of a set of pixels of the array of pixels.

14. The method of claim 13, wherein

the set of pixels comprises pixels that are partially covered by the glyph.

15. The method of claim 13, wherein

determining the forces that are applied to the glyph is further based on a preferred spacing of the glyph relative to an adjacent glyph.

16. The method of claim 10, wherein

determining the forces that are applied to the glyph is based on a preferred spacing of the glyph relative to an adjacent glyph.

17. The method of claim 10, wherein

determining the forces that are applied to the glyph is based on at least one of:

a linear model,

a force-density model,

a spring model, and

a gravity well model.

18. The method of claim 10, wherein

determining the forces that are applied to the glyph is based on a coverage of one or more pixels by the glyph, so as to effect a change of the coverage of the one or more pixels by the glyph.